Pre-competition cardiac screening in professional handball players - setting up at the EHF European Handball Championship 2010 in Austria

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Abstract: In many sports, regular cardiac screening for exercise-associated sudden cardiac death is still not provided. To set up the current situation in top-skilled handball players qualified for the 2010 European Handball Championship in Austria, a standardised questionnaire was sent to every team. The fact that only 42.7% of the players returned the questionnaire may lead to the conclusion that the awareness of the problem is quite low. However, 82% of these players have been screened according to current recommendations. Half of the teams were screened inhomogeneously: 5 players (4.1%) have not been screened within the last years, 1 athlete (0.8%) was screened without an ECG. While 69% of the athletes got their first screening only after the age of 18, 16 players (13.1%) never went through a specific screening ever. We identified 17 athletes (13.9%) with a highly suspicious history, 2 of them (1.6%) never underwent a medical screening at all.

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Pre-competition cardiac screening in professional handball players – setting up at the EHF European Handball Championship 2010 in Austria

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Kardiale Vorsorgeuntersuchung bei professionellen Handball Spielern – Standortbestimmung im Rahmen der EHF Handball Europameisterschaft 2010 in Österreich

Zusammenfassung. In vielen Sportarten wird ein regelmäßiges, richtliniengetreues kardiales Screening zur Verhinderung des plötzlichen Herztods noch immer nicht gewährleistet. Wir nahmen die Handball Europameisterschaften, welche 2010 in Wien und weiteren Städten in Österreich stattfanden, zum Anlass, die aktuelle Situation bei Toplevel-Handballern zu untersuchen: Ein standardisierter Fragebogen wurde vor dem Turnier an alle qualifizierten Teams und Spieler versandt. Eine Rücklaufrate von 42,7 % kann zum Schluss führen, dass das Problem des plötzlichen Herztods bei den Spielern und Verantwortlichen unterschätzt wird. Die überwiegende Mehrzahl der Spieler (82 %) wurde gemäß der Auswertung der Fragebögen korrekt, entsprechend der aktuellen Screening-Richtlinien untersucht. In gut der Hälfte der Teams wurde das Screening jedoch „inhomogen" durchgeführt. 5 Spieler (4,1 %) wurden zumindest nicht innerhalb der letzten Jahre untersucht, bei 1 Spieler (0,8 %) wurde kein EKG durchgeführt. Während 69 % der Handballer ihr erstes Screening erst nach dem Alter von 18 Jahren durchliefen, wurden 16 Spieler (13,1 %) gar niemals zuvor einer kardialen Vorsorgeuntersuchung unterzogen. Schließlich identifizierten wir aufgrund der Fragebögen 17 Athleten (13,9 %) mit einer hoch suspekten Anamnese, wovon 2 Athleten (1,6 %) niemals zuvor kardiologisch abgeklärt wurden.

Schlüsselwörter: Plötzlicher Herztod, kompetitiver Sport, Handball, kardiales Screening

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Summary. In many sports, regular cardiac screening for exercise-associated sudden cardiac death is still not provided. To set up the current situation in top-skilled handball players qualified for the 2010 European Handball Championship in Austria, a standardised questionnaire was sent to every team.

The fact that only 42.7% of the players returned the questionnaire may lead to the conclusion that the awareness of the problem is quite low. However, 82% of these players have been screened according to current recommendations. Half of the teams were screened inhomogeneously: 5 players (4.1%) have not been screened within the last years, 1 athlete (0.8%) was screened without an ECG. While 69% of the athletes got their first screening only after the age of 18, 16 players (13.1%) never went through a specific screening ever.

We identified 17 athletes (13.9%) with a highly suspicious history, 2 of them (1.6%) never underwent a medical screening at all.

Key words: Sudden cardiac death, competitive sports, handball, cardiac screening

Introduction

Although exercise-associated sudden cardiac death (SCD) in young competitive athletes is overall quite rare [1–5], these fatal events always represent an incredible tragedy. However, most of these events could be prevented by an adequate pre-competition cardiac screening [6–8]. Although the large European and American cardiologic societies and the International Olympic Committee (IOC) implemented their specific recommendations concerning prevention of exercise-related sudden cardiac death [9–18], in many sports associations and clubs, a regular cardiac

screening is still not assured. This fact is alarming as especially the long lasting Italian experience with large cohorts of athletes impressively demonstrated that an accurate regular and cost-effective cardiac screening prevents more than 90% of exercise-related SCD in young competitive athletes [7, 8].

This basic screening, regularly repeated every single or second year (beginning at the age of 12 to 14) consists of three major factors: Firstly, an accurate acquisition of the athlete's history, including personal as well as family history. The importance of the athlete's history may be outlined by the fact that most of the underlying cardiac conditions leading to an increased risk of SCD are inherited [1–5]. Secondly, a focused physical examination of the athlete and finally, a 12-lead resting ECG completes the basic screening strategy. It is the use of the ECG (recommended by the IOC, the European Society of Cardiology (ESC) and important sports associations as the "Fédération International de Football" [FIFA]), which has mainly been shown to be responsible for the dramatic decrease of SCD cases during the last decades [7, 8].

While associations like FIFA implemented and developed updated and specific guidelines and try to assure the feasibility of their pre-competition medical screening (PCMA), the situation in other popular sports is rather unknown.

The recent tragic death of a young German handball player in 2009 and this year´s EHF European Handball Championship taking place in Austria were our main incitements to highlight the current situation concerning prevention of sudden cardiac death in handball, one of the most popular sports in Europe and increasingly worldwide.

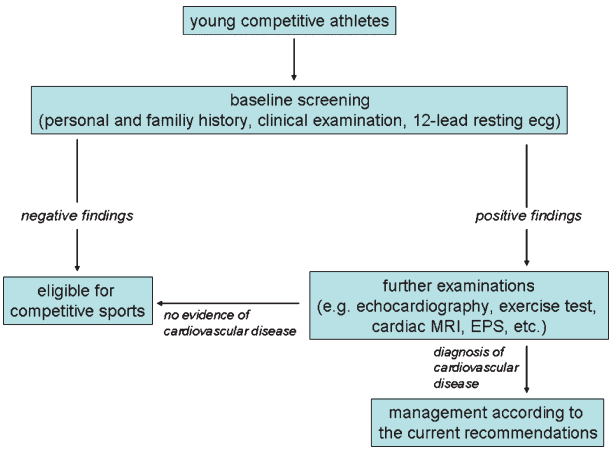

Fig. 1: Flow diagram illustrating the modality of cardiovascular pre-participation screening recommended by the European Society of Cardiology section of Sports Cardiology (modified figure from Corrado et al. [28])

The fact that handball is played by more than 30 million athletes all over the world (about 850 000 handball players in Germany) reinforces the need for an adequate awareness concerning pre-competition medical screening.

The aim of our study was to evaluate the current situation in top skilled handball players, to judge the current concept and to provide adaptions and consequences that might also serve as a role model for other sports.

Methods

In agreement with the European Handball Federation (EHF), a standardised questionnaire (provided in different languages: English, German, Spanish and Serbo-Croatian, respecting the origin of the different teams) was sent to every team that qualified for the 2010 EHF European Handball Championship three months prior to the tournament. The questionnaire was generally based on the recommendations of the International Olympic Committee and the ESC [9, 15]. It was subdivided into two parts: The first part of the questionnaire gathered the personal and family history based on the recommendations of the International Olympic Committee and the ESC [15, 18]. The second part evaluated whether the athletes ever got a pre-competition medical screening before and if so, what this screening included and if it was repeated regularly (e.g. medical history, physical examination, ECG, exercise test and echo).

The acquisition of the data was anonymised and the investigators had no possibility to draw conclusions on the identity of a player but only the team he played for.

The teams were asked to return the questionnaires until the beginning of the tournament. If a team did not return their questionnaires within four weeks we sent a reminder.

Results

Participants

The competing 16 national handball teams participated with a total of 286 players at the 2010 EHF Men's European Championship. It is important to mention that the EHF did not impose any specific warranties concerning medical screening prior to the championship.

Finally, 8 of the 16 teams (respectively 122 of a total of 286 competing players: 42.7%) did return the

questionnaires. Although we sent a "reminding invitation" to the teams that did not pass their questionnaires, no further documents have been submitted subsequently.

Baseline criteria/epidemiologic data

The mean age of the 122 players who returned the questionnaire was 27.6 years (range 19–38; median: 27.75).

The average duration of physical exercise per week was 16.7 hours (range 8–28, median: 16.75).

Appropriateness of former cardiac screening

From the eight teams that returned the questionnaire, four entire teams (labelled in Fig. 2 as "1–4") with a total of 62 players (50.8% of the players who returned the questionnaire) were screened "correctly" according to the current ESC-/IOC- recommendations. Particularly, these athletes received an accurate acquisition of the personal and family history, as well as a focused physical examination and finally, a 12-lead resting ECG – regularly repeated every single or second year.

The four remaining teams were screened inhomogeneously: Of their 60 players, only 38 athletes (31.2% of all submitting players) were screened according to the current guidelines, which makes a total of 100 athletes of the 122 athletes who have been examined "correctly" (82%).

Five players (4.1%) have been screened according to the current guidelines but not within the last two years. One athlete (0.8%) received a screening, which included history and examination but never had an ECG (this concept complies with the "American" recommendations; see above). Sixteen players (13.1%) never went through a specific screening examination at all.

Initial screening tests

Regarding the very first pre-competition screening of the players, we found that 73 of the athletes whoever got some kind of screening examination (73/106 = 69%) went through their first cardiac screening after the age of 18, while it is recommended to start at an age of 12–14 [9, 15, 18].

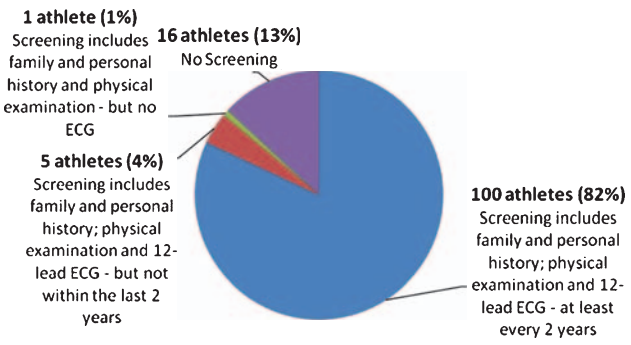

Fig. 2: Former cardiac screening of the players (122 athletes) who returned the questionnaire

Suspicious findings

By interpreting the questionnaires according to the recommendations of the ESC/IOC, we identified 17 athletes (13.9%) with a suspicious personal and/or family history. Although most of them got unsuspicious further evaluation (e.g. by stress-test or echocardiography), two athletes (1.6%) with a highly suspicious personal history ("shortness of breath out of proportion to the degree of exertion" and "exertional chest pain") belong to the group of players that never underwent a pre-competition medical screening at all.

Discussion

An accurate medical screening of athletes, especially if they perform competitive sports implicating a high impact of physical and psychological stress, should be a mainstay of every athletes care [15, 16, 18]. Although adequate immediate/emergency care interventions, e.g. basic life support and the early use of automatic external defibrillators could potentially rescue athletes who suffer from sudden cardiac arrest (SCA), the majority of the events results in serious outcomes, sometimes even in sudden cardiac death (SCD) [22–24]. This emphasizes the significance of regular cardiac screening of athletes at any level: More than an estimated 80% of exercise-related sudden cardiac deaths can be prevented [7]. The fact that only 50% of the teams in our survey returned the questionnaire may lead to the conclusion that the awareness of the problem is quite low. Therefore, it is speculative if the moderate return rate implicates that a cardiac screening concept of the concerning national teams, respectively the specific countries themselves, is lacking. On the other hand, it might point out that a regular screening program is already well established and thus the teams did not use the given possibility to participate in our survey. Nevertheless, the teams that returned the questionnaire did it in a very accurate way so the data could be interpreted accurately.

In other surveys, e.g. the evaluation of pre-competition medical assessment (PCMA) prior to the FIFA Football World Cup 2006, which showed a return-rate of 82% [21] there was an agreement between the national associations and the governing body prior to the survey. This might explain a better compliance.

One of our major aims was to survey the "status quo" of cardiac screening in handball at the European top level: Therefore, it is important to state that more than a third of these players (who were screened correctly) are playing for a national team that integrates other players which have not been screened according to the current guidelines. This inhomogeneous pattern reflects the different screening concepts of the countries these athletes play regularly for their local clubs. Nevertheless, a governing body as the EHF could provide guidelines and recommendations to gain an integrative screening concept for its members. Events like the recent championship can provide further important information about acceptance and accuracy of the recommended screening.

Although five of the participating players (4.1%) have been screened according to the current guidelines until 2 years prior to the current championship, they did not undergo an adequate screening within the last 2 years. As some of the inherited cardiopathies do not manifest until an older age, screening examinations should be repeated on a regular basis. Most of the guidelines recommend the screenings on a 1 or maximum 2 year basis [6, 18].

One player has been screened regularly according to the North-American guidelines (only physical examination and questionnaire). These North-American guidelines follow a concept, which excludes the 12-lead resting ECG in the primary screening, mostly due to reasons of cost-effectiveness and retentions because of the expected high rate of "false-positive" findings. However, the use of 12-lead resting ECG in the primary screening leads to a dramatic decrease of exercise-related sudden cardiac deaths [6–8, 9–12]. The objection concerning a high rate of "false positive" ECG findings is justifiable, but it can be diminished by improved recommendations concerning the correct interpretation of an athletes ECG [20]. By analyzing data from various athletes of different gender, sociocultural and ethnic background these recommendations can be developed further and tailored for a specific cohort of athletes [19].

The fact that 16 players (13.1%) at a top level of one of the most popular sports in Europe never went through a specific screening examination at all is alarming and should have immediate consequences. Only consistent education may guarantee an adequate awareness of the problem. Furthermore, due to various backgrounds of the players, the governing body of the specific sport (e.g. the EHF) could provide support by offering an integrated and comprehensive screening concept.

The costs of this screening concept are a frequent detractors' target. However, young athletes, in whom a potentially fatal underlying condition could have been detected, are likely to survive many decades with a normal or nearly normal life expectancy [13, 15]. Previous surveys showed cost estimates per "year of life saved" consistently below $ 50,000 [25–27], which is the traditional threshold to consider a health intervention as cost-effective. A recent analysis estimates that adding an ECG to history and physical examination in the screening protocol of athletes aged 14–22 years saves 2.06 life-years per 1000 athletes, at a cost of $ 42,000 per life-year saved [27].

Most of the guidelines recommend starting regular examinations at the very beginning of competitive sports, which usually equals an age of 12–14 years [6, 9, 11, 12, 15, 18]. Nevertheless, cardiac screening of children poses special requirements on the examinator (e.g. interpretation of ECG). In our survey, 69% of the athletes whoever got screening examinations went through their first cardiac screening not until the age of 18, as such far above the recommended level [6, 9, 11, 12, 15, 18].

To gain a rough overview about risk constellations, our questionnaire was supplemented by a section which included the adapted standardized questionnaire of the screening recommendations of the IOC ("Lausanne recommendations"). Interestingly enough, we identified 17 athletes (13.9%) with a suspicious personal and/or family history. Although most of them got unsuspicious further evaluation (e.g. by stress-test or echocardiography), 2 athletes (1.6%) with a highly suspicious personal history belong to the group of players that never underwent a pre-competition medical screening at all.

Limitations of the study

Drawbacks that are generated by surveys relying on questionnaires are obvious: The accuracy of these self-assessments is unknown and there might be a trend towards "social acceptance" while answering the questions. However, this survey should serve as a "position-fixing" and should therefore set a foundation stone for a sophisticated screening concept in any kind of sport.

The moderate return-rate of the questionnaires may be seen as a drawback. Nevertheless, the percentage of participation can also lead to conclusions and the players who returned the questionnaire did it in a very accurate way.

Although we provided the questionnaires in various languages to increase the approval, there were still players who had to read questionnaires in a foreign language. This might have led to a lower return rate.

Conclusion

The fact that only 50% of the teams respectively 42.7% of the competing players returned the questionnaire may lead to the conclusion that the awareness of the problem is quite low.

Most of the national teams showed inhomogeneous screening concepts, which may be explained by different screening concepts of regional clubs these athletes play for. Apart from the relatively high rate of 82% of players who regularly undergo an adequate cardiac screening, the fact that 16 players (13.1%) at this top level never went through a specific screening examination at all is alarming and should have immediate consequences, particularly, as two of these players have a suspicious personal history.

Conflict of interest

The authors declare that there is no conflict of interest.

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